

## **REMARKS**

In response to the Office Action mailed November 28, 2007, Applicants request reconsideration of this application in view of these remarks and amendments.

Claims 13, 24, and 27 are amended. Claim 26 is cancelled. New claims 32-35 are presented. Claims 1-9 and 18-22 remain withdrawn. Claims 10-17, 23-25, and 27-35 are now pending.

### **I. Rejections Under 35 U.S.C. § 112, Second Paragraph**

Claims 10, 13, and 24 were rejected for being indefinite. In claims 10 and 13, the Examiner alleges that it is indefinite to have mono-block and diblock polymer chains because the outer and inner layer can be formed of the same monomer. However, one of skill in the art would not read the claims in a way that would exclude diblock polymers. Claims 10 and 24 require that the “inner layer includ[es] second monomer units comprised of an alkenylbenzene.” Claims 10 and 24 also require that the “outer layer includ[es] first monomer units selected from the group consisting of alkenylbenzenes, conjugated dienes, alkylanes, and mixtures thereof.” Nothing requires that the alkenylbenzene of the inner layer be the same as the alkenylbenzene of the outer layer in the diblock polymers. The fact that claims 10 and 24 are further limited to require that both mono-block and di-block polymers must be present in the nanoparticle clearly restricts the claims from being read this way. Accordingly, there must be at least one diblock polymer chain that includes an alkenylbenzene block and a block of some other monomer such as a different alkenylbenzene, a conjugated diene, or an alkylene. This is not to say that the

claim excludes the monoblock polymer chains from having one of the same monomer species as the diblock copolymer chains.

Regarding claim 13, it clearly states that “the alkenylbenzene monomer units of the outer layer and the alkenylbenzene monomer units of the inner layer are *independently* selected.” Thus, the limitation of claim 10 that requires that diblock polymers must be included in the nanoparticle would prevent a selection in claim 13 of the same monomer species for both inner and outer layers and reading claim 13 in a way that would be inconsistent with a diblock polymer. Claim 13 would not be indefinite to one of skill in the art who knows that diblock polymers must be composed of two different species. However, in an effort to further prosecution, claim 13 is now amended to be even clearer that diblock polymer chains do not have the same alkenylbenzene monomer units in both the outer layer and the inner layer.

## **II. Rejections Under 35 U.S.C. § 103**

Regarding the rejection of claim 10 and its dependent claims, the Office Action does not make a *prima facie* case of obviousness because it completely fails to address an element of independent claim 10: “wherein said nanoparticles … include mono-block and diblock polymer chains.” The fact that the Examiner may have considered this limitation to be indefinite does not remedy the lack of its inclusion in the obviousness rejection. *See* MPEP § 2143.03 (“A claim limitation which is considered indefinite cannot be disregarded.”). Furthermore, this limitation is not taught or suggested by Krom or the other cited references. While Krom (column 3, lines 16-19) discloses that “additional conjugated-diene monomer and/or vinyl-substituted aromatic hydrocarbon monomer can be added to the polymerization mixture as desired,” this would only

increase the size of the nanoparticles, it would not cause mono-block polymers to be included in the nanoparticle structure and it would have only a negligible effect on the polydispersity of the nanoparticles. Applicants assert that the above-stated limitation is not taught or suggested by the cited references and, for at least this reason, claim 10 and its dependent claims should be allowed.

Regarding new independent claim 32 and its dependent claims, claim 32 requires both mono-block and di-block polymers, and thus it should also be allowed for at least the reason explained above for the similar limitation in claim 10.

Regarding both independent claim 10 and amended independent claim 24 and their dependent claims, the Office Action correctly notes that neither Krom nor EP ‘142 discloses the polydispersity index of about 1.5 to 10. The Office Action cites to Wang ‘486 as disclosing this element, yet there is a clear error in applying Wang ‘486 in the obviousness rejection: Wang ‘486 only discloses a completely different type of composition than what is disclosed in Krom and EP ‘142. Wang ‘486 describes a layered material, but this is not a core-shell polymer layered material—it is an *inorganic, clay* material. *See* Wang ‘486 column 7, line 41 – column 8, line 41. The composition disclosed by Wang ‘486 is a nanoclay composition that requires the presence of a layered inorganic clay substrate. *See* Wang ‘486, Examples. There is no reason to combine a teaching of polydispersity in an inorganic nanoclay composition with references that only relate to core-shell polymeric nanoparticles. Clearly, the method used in Wang ‘486 to create nanoclay compositions is not relevant to creating the claimed polydispersity in the nanoparticles of the present claims. In fact, Wang ‘486 demonstrates that the use of a layered clay material is the very thing that allows controlled molecular weight and thus controlled

polydispersity. *See* Wang '486, col. 14, lines 23-27 ("layered material Cloisite® 15A [a type of clay] affords a controlled polymerization process, i.e., higher monomer conversion ... and controlled molecular weight."). Accordingly, Wang '486 is not relevant to Krom or EP '142, nor would it enable one of ordinary skill in the art to make the claimed core-shell nanoparticles with the designated polydispersity.

In addition, and this argument applies to the rejection of all of the claims, the three cited references are all significantly different types of particles made with significantly different methods, and one of ordinary skill in the art would not have a reason to combine any one reference with another. As mentioned above, Wang '486 discloses a nanoclay composition, for which a critical ingredient in the composition and process is a layered inorganic clay material. Regarding EP '142, contrary to the Office Action,<sup>1</sup> a review of EP '142 does not disclose living anionic polymerization of nanoparticles, nor does it show an alkenylbenzene core. The Office Action on page 4 admits as much stating that the "*rubbery*<sup>2</sup> core polymer [of EP '142] is formed from a polybutadiene by *emulsion* polymerization technique." Additionally, there is no reason to combine Krom with either EP '142 or Wang '486, because Krom discloses a hard (not rubbery) core, it is not a clay nanocomposite, and it teaches away from a polydisperse nanoparticle, stating that the nanoparticles are preferably monodisperse (*See* Krom, column 2, lines 10-15). Accordingly, there is no reason or motivation to combine the references, and there is even teaching away from their combination.

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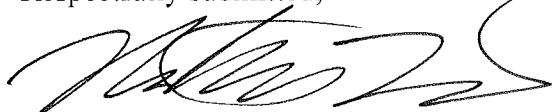
<sup>1</sup> The Office Action states on page 5 that "[a]ll cited references disclose a living polymerization process for obtaining nano-composites."

<sup>2</sup> Alkenylbenzenes are known by those of skill in the art as not rubbery.

### **III. Conclusion**

For the foregoing reasons, the Office Action failed to establish a *prima facie* case of unpatentability for each claim and the claims of this application are believed to be patentable over the prior art. Applicants respectfully request that the rejections be withdrawn and that this case be passed to issue.

Respectfully submitted,



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